

CLAIMS

- 1 A method of installing a sensor located in a carrier on the outside of a casing, comprising the steps of positioning the casing in a well, cementing the casing in position, positioning a drilling tool inside the casing level with the carrier, drilling through the casing, carrier and cement into the formation surrounding the well so as to create a fluid communication path, and sealing the hole drilled in the casing.
- 2 A method as claimed in claim 1, wherein the drilling and sealing operations are preferably performed using a tool that is run into the well so as to be positioned adjacent the carrier, the tool being removed from the well after the drilling and sealing operations are completed.
- 3 A method as claimed in claim 2, wherein the tool is used to create a drawdown across the drilled hole to produce reservoir fluid through the hole and clean it of debris and skin damage.
- 4 A method as claimed in claim 3, further comprising making a direct measurement of formation pressure prior to sealing the hole.
- 5 A method as claimed in any preceding claim, wherein the drilling and sealing operations are repeated at intervals throughout the life of the well.
- 6 A method as claimed in any preceding claim, wherein the sensor is mounted in a chamber in the carrier.
- 7 A method as claimed in claim 6, wherein the sensor is mounted at one end of an elongate chamber, the hole being drilled through the chamber at a point remote from the location of the sensor.
- 8 A method as claimed in claim 6 or 7, wherein a buffer tube is installed in the chamber which extends to the sensor, the hole being drilled through the buffer tube as well as the chamber.

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- 9 A method as claimed in claim 6, 7 or 8 wherein the chamber is be filled with a permeable material such as a permeable cement or sintered metal, the hole being drilled through the permeable material.
- 10 A method as claimed in any of claims 1 to 5, wherein the carrier comprises a permeable material encapsulating the sensor.
- 11 A method as claimed in any preceding claim, comprising positioning the drilling and plugging tool inside the casing relative to the chamber through which it is to drill using an indexing system located inside the casing.
- 12 A method as claimed in claim 11, further comprising using a measurement of formation properties to indicate the depth of the tool in the well.
- 13 A method as claimed in any preceding claim, wherein a series of sensors are installed, each in a separate chamber on the outside of a respective casing.
- 14 A method as claimed in any preceding claim, further comprising running a cable along the outside of the casing in the well from the or each sensor to the surface.
- 15 A method as claimed in claim 14, wherein when installing the casing carrying sensors into the well, the casing can be rotated as it is inserted into the well such that the cable is wound in a spiral manner around the casing.
- 16 A method as claimed in claim 14 or 15, comprising providing regularly spaced spacers on the cable which allow a space to be maintained between the cable and the outside of the casing.